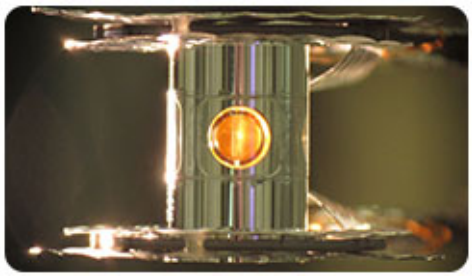
LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory Feb. 10-14, 2014.

The New York Times

A GIANT STEP ON THE ROAD TO IGNITION



A metallic case called a hohlraum holds the fuel capsule for NIF experiments. Photo by Eduard Dewald/LLNL

For the first time ever, Lawrence Livermore scientists have made a notable advance in extracting energy from nuclear fusion, by achieving fuel gains greater than those deposited.

Fusion is the same process that powers the sun and the stars. The National Ignition Facility, the largest and most energetic laser, was designed to create fusion ignition in a laboratory setting.

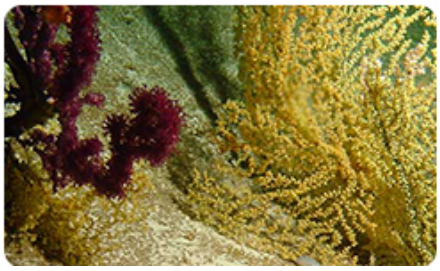
In the experiment, conducted last fall, researchers blasted 192 lasers at a target the size of a peppercorn. It triggered a fusion reaction that unleashed a vast amount of energy -- albeit for a fraction of a second. In effect, the process created a miniature star.

"This sounds very modest," said Omar Hurricane, the Livermore scientist leading the project. "And it is. But this is closer than anyone has gotten before, and it is unique to finally get as much energy out of the fuel as was put in."

To read more, go to the *The New York Times*.

For other articles on this subject, *go to* *The Wall Street Journal*, *The Washington Post* *National Geographic*, *Wired* and NPR.

The Seattle Times **A CHANGING PH**



A Lawrence Livermore scientist and collaborators have studied coral to determine that a long-term shift in nitrogen content in the Pacific Ocean has occured as a result of climate change. Image courtesy of NOAA Hawaii Undersea Research Laboratory.

In science, PH is a measure of the acidity of any liquid solution and the pH of the oceans is getting higher and higher.

As the oceans absorb more CO2 from cars and power plants, that is transforming the chemistry of the seas faster than at any time in tens of millions of years. The CO2 makes life hard for creatures with shells and skeletons like those in coral reefs and threatens to fundamentally transform the entire marine world.

Acidification is trouble for tiny see-through creatures called pteropods, which are critical food for birds and fish. It poses risks for important sea life, including coral reefs and many fish.

Until the growth of CO2 is halted, said Greg Rau, a marine chemist at Lawrence Livermore, ocean acidification will keep getting worse. "That's not a threat or a prediction," Rau said. "It's a promise."

To read more, go to the *Seattle Times*.

LaserFocusWorld
Photonics Technologies & Solutions for Technical Professionals Worldwide

HEADING EAST

The High Repetition-Rate Advanced Petawatt Laser System, or HAPLS, is being designed, developed, assembled and tested at Lawrence Livermore.

Lawrence Livermore is heading east when it helps construct a revolutionary high-power laser system for the European ELI-Beamlines science facility in the Czech Republic.

LLNL is constructing the "High Repetition-Rate Advanced Petawatt Laser System" (HAPLS) for the ELI-Beamlines facility. This facility will deliver peak powers greater than one petawatt (1 quadrillion watts) at a repetition rate of 10 Hz, with each pulse lasting less than 30 femtoseconds, or 0.00000000000003 seconds.

In order to achieve this, the HAPLS laser requires a state-of-the-art laser "front-end" source to generate the ultrafast pulse at high stability with ultra-low noise and robust operation.

To read more, go to *Laser Focus World*.

Mail Online

SPACE JAM

Lawrence Livermore researchers are developing nanosatellites to help control the 22,000 objects in orbit that are considered space junk.

A team at Lawrence Livermore are building a swarm of tiny satellites that will monitor and help the vast amounts of traffic in orbit.

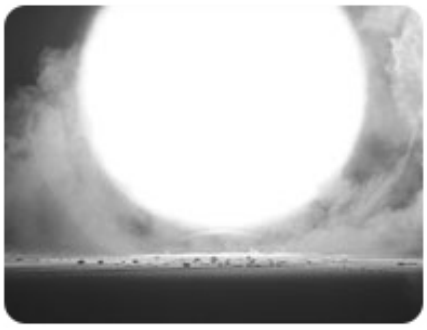
The scientists already have tested their system in the lab. They used a series of six images over a 60-hour period taken from a ground-based satellite to prove that it is possible to refine the orbit of another satellite in low earth orbit.

Collisions in space of satellites and space debris have become increasingly problematic.

To read more, go to the *Daily Mail*.

ScienceNews
MAGAZINE OF THE SOCIETY FOR SCIENCE & THE PUBLIC

SHELTER, DROP AND COVER



Nuclear explosions produce radioactive ash and dust that must be avoided to minimize risks of radiation poisoning and cancer. Image courtesy of U.S. Defense Threat Reduction Agency.

Atmospheric scientist Michael Dillon of Lawrence Livermore has developed some helpful rules of thumb that increases the probability of survival if there is a nuclear attack.

He focused on minimizing total radiation exposure regardless of blast size, wind direction or many other factors that could affect radiation levels. In math terms, he minimized the area under the curve of radiation exposure over time.

One way to minimize that total exposure is to get to a location that blocks more radiation. The best shelter is below ground -- as in a basement. Hiding in the basement of a large apartment or office building can bring radiation levels down to one two-hundredth of the outdoor dose, a protection factor of 200. Being inside a one-story wooden house, on the other hand, may only cut exposure in half, a protection factor of 2.

To read more, go to *Science News*.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send e-mail